

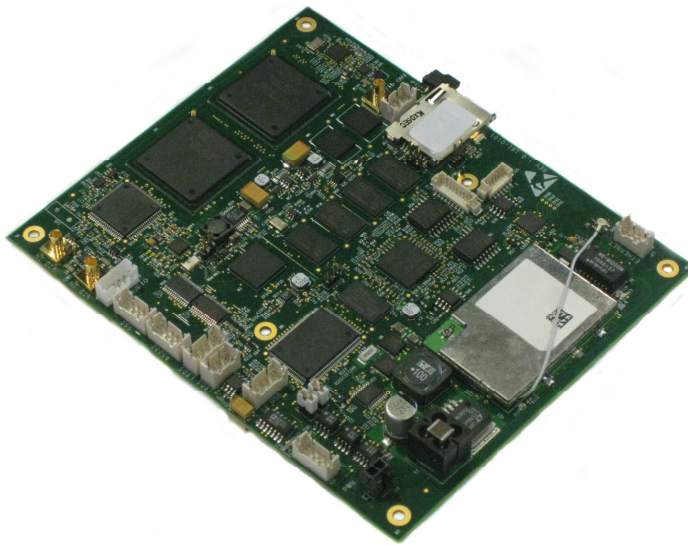
Essential Viewing

TVI I300 Hardware Manual



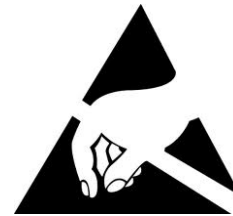
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1 Overview



TVI I300

OEM CODEC Rev 2.0



**WARNING - OBSERVE PRECAUTIONS
FOR HANDLING ELECTROSTATIC
SENSITIVE DEVICES**

To support OEM integration Essential Viewing provides two boards providing equivalent functionality to the TVI C200 and TVI C300 encoders. This manual covers the TVI I300 which has been designed to allow for the construction of a unit providing as a minimum the capabilities of the TVI C300 encoder.

The I300 provides for the capture and compression of analogue video and audio to a digital stream where this stream can be forwarded to a TVI Server for distribution to one or more recipients. This stream is normally formed into IP packets for transport over any network supporting IP. The I300 provides two routes for IP streaming, namely;

- An Ethernet port for operation over a LAN or for connection to a router for operation over a WAN,
- An integrated cellular modem supporting streaming over GPRS, EDGE, WCDMA and HSDPA networks.

The I300 has been designed for integration into an enclosure offering RF shielding and operation as an open system may cause harmful interference to other electrical devices in close proximity.

To meet EMC regulations it is imperative that the board is mounted in an enclosure that provides RF shielding. All bulkhead connectors must be grounded to the enclosure and, where stated in the documentation, shielded cables must be used to link the board to the bulkhead connectors.

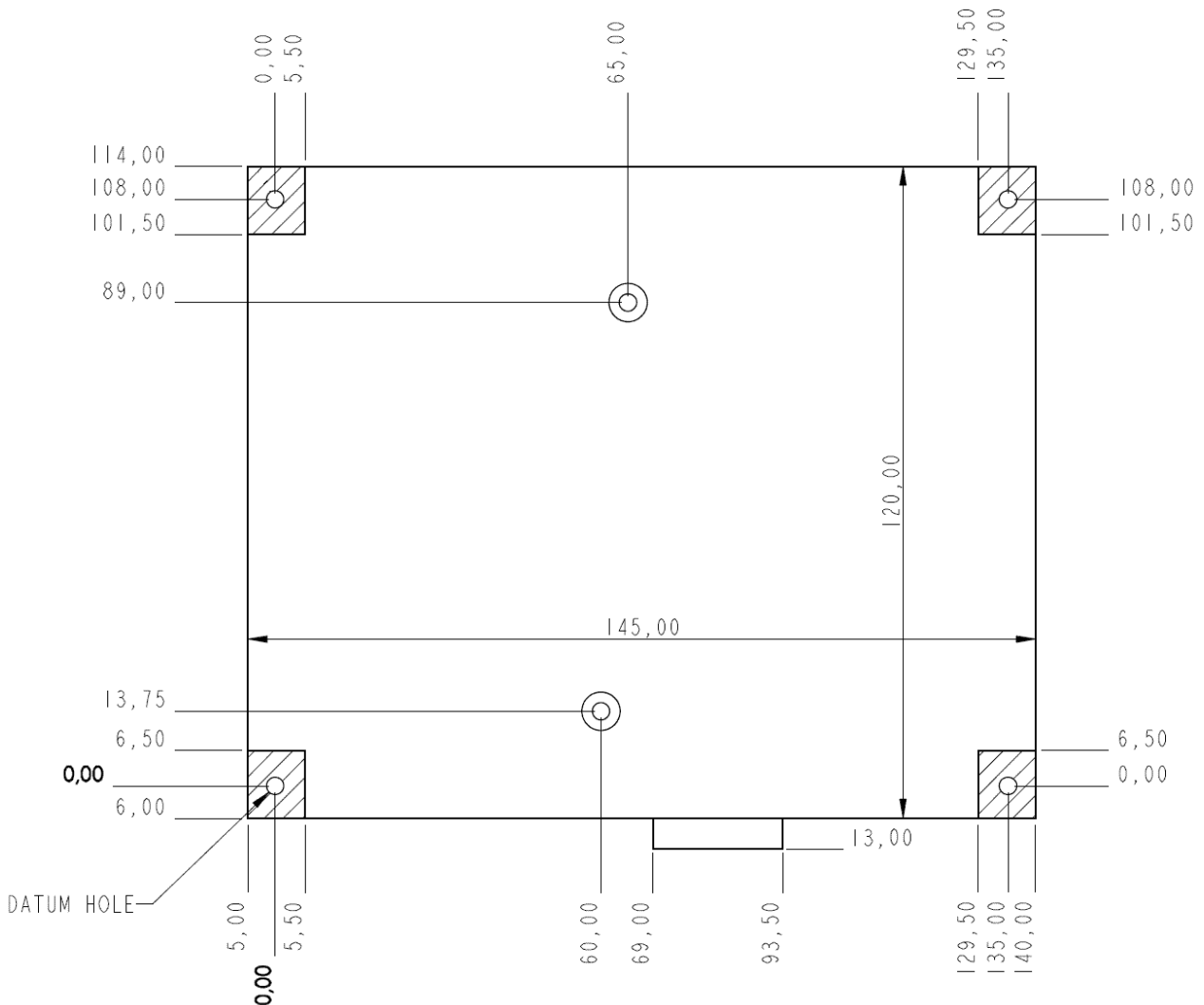
It is the responsibility of the integrator to obtain the necessary regulatory compliance to cover operation of the unit within the territories into which the unit will be deployed.

2 Specifications

Input supply voltage	9v to 36v DC	
Power requirements @ nominal 12v DC	Sleep	0.1W
	Standby	1.7W
	Operational over LAN	6.1W
	Operation over WCDMA	8.3W
	Operation over GPRS	9.5W
Max power requirement (Low signal GPRS)	1A @ 12v, 12W	
Operating temperature (free air)	-32°C to 80°C	
Storage temperature	-32°C to 125°C	
Dimensions (L x W)	127 x 145 mm	
Video Inputs	2 x composite 1v p-p	
Video Output	1 x composite 1v p-p	
Audio Inputs	2 x line level (-10 dBv)	
Audio Outputs	2 x line level (-10 dBv)	
Ethernet Interface	10/100 Base-T	
USB	Dual USB 2.0 Host	
Cellular Modem	Telit UC864-G	
Serial Ports	1 x RS232	
	1 x RS422/RS485	
	1 x Synchronous Serial (SSI)	
Status	drives 5 x Tri-state LEDs	

3 Mechanical Dimensions

The TVI I300 PCB is 120mm long by 145mm wide by 1.6mm deep. The board incorporates six M3 sized grounded holes to support mounting of the board within an enclosure. The mounting points are specified by the following diagram where all dimensions are in mm and the view is of the top side of the board.



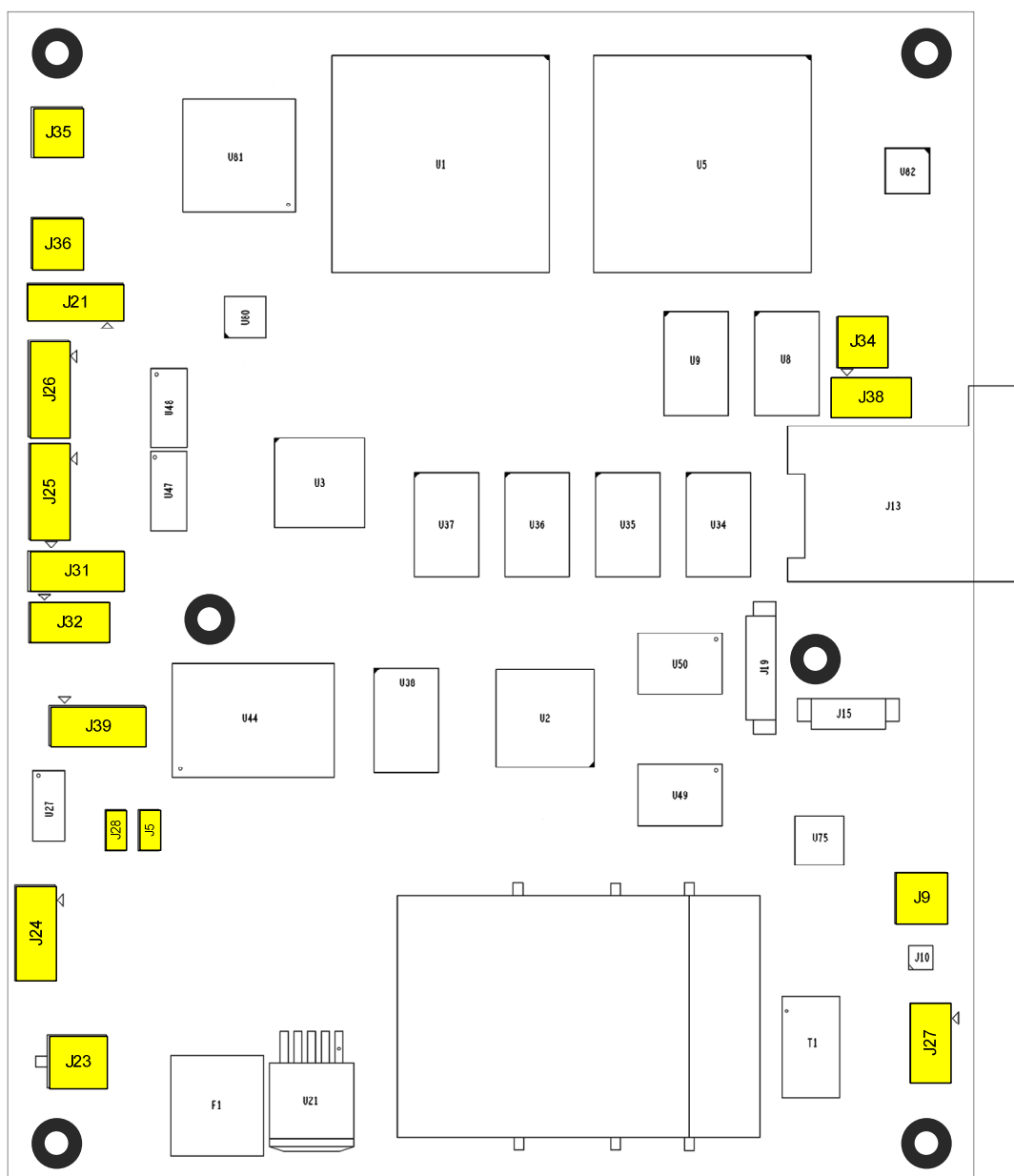
Note that when using the mounting holes, an M3 flat washer must be used on both sides of the board where the washer must have a diameter no greater than 7mm.

The I300 board includes a SIM carrier to support cellular operation where this is mounted at the front of the board extending the length by 7mm to 127mm.

4 TVI I300 Board Connectors

The I300 board has been designed for mounting within an enclosure where connectivity to either a companion board or to bulkhead connectors is achieved via flying leads to board mount headers. The following diagram illustrates the layout and location of the I300 headers and connectors where these are prefixed by a "J" code on the PCB.

Note that headers utilised for only for manufacture are not documented and must remain unconnected during normal operation.



4.1 Connector Parts

The following parts are required for connection to the I300 board. *Note that wires must not be soldered directly to any pins on the board.*

	Part	Quantity	Port(s)
	50 ohm SMA plug	1	Cellular RF
	Mini SMB 75ohm plug (RG-179 cable) Amphenol: 903-586P-71A Tyco Electronics: 5415484-1	3	2 x video in 1 x Video out
	JST, PHR connector PHR-5 (24 to 28 AWG cable)	1	Audio
	JST, PHDR connector PHDR-08VS (24 to 28 AWG cable)	3	Ethernet Status LEDs Ext. SIM
	JST, PHDR connector PHDR-10VS (24 to 28 AWG cable)	5	USB 2.0 RS232 RS422 SSI Status LEDs
	Molex 43025-0200 (24 AWG cable)	1	Power
	JST – (Crimp connector for all parts except power) SPHD-002T-P0.5	75	1 x PHR-5 3 x PHDR-08VS 5 x PHDR-10VS
	Molex – (Crimp for power) 43030-0007	2	Power

4.2 Cellular RF Antenna – J9

The I300 includes an onboard cellular modem which requires an external RF antenna to operate. The antenna connector on the I300 is an SMA socket labelled as J9.

The connection from J9 to the external antenna must be via coax with a 50 ohm per meter impedance. If the link to the antenna is routed through a bulkhead connector then this connector must be a 50 ohm coax RF connector where the body of the RF connector is grounded to the enclosure. The internal linkage from J9 to the bulkhead connector must be 50 ohm coax and a 50 ohm SMA plug must be used. It is vital that the connection between the coax cable and the bulkhead connector maintain the integrity of the coax shielding.

Failure to use the correct coax cable and connectors will result in poor cellular performance and is likely to cause undesirable EM interference and potentially damage to the modem.

4.3 Audio Inputs/Outputs – J21

The I300 provides dual channel line in audio and dual channel line out audio on header J21 where inputs and outputs are at line level. The following table specifies the mating connector and connector pins.

J21 – 5x1 JST PHR connector	
Description	Pin
Audio left input	1
Common ground	2
Audio left output	3
Audio right input	4
Audio right output	5

4.4 Power Input – J23

The I300 is powered via J23 where an input voltage in the range of 9v to 36v DC is supported. The following table specifies the mating connector and connector pins.

J23 – 2x1 Molex Micro-Fit header 3.0mm pitch	
Description	Pin
+DC supply	1
0v (chassis GND)	2

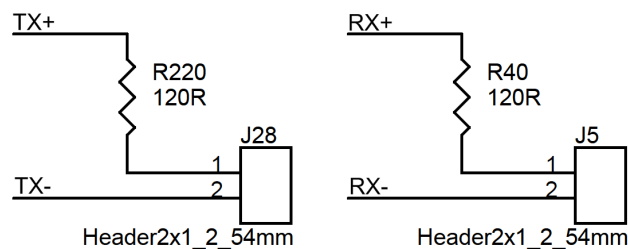
Note that while the I300 board incorporates a filter on the DC input it may be necessary in some circumstances to utilise a common mode choke on the power input to suppress induced electromagnetic interference and DC-DC switching noise. Where a choke is utilised within an enclosure it is important to minimise the length of the cables between the DC input socket and the choke.

4.5 RS422/RS485 & Triggers – J24

The I300 provides a configurable RS422/RS485 port together with three isolated trigger inputs on header J24. Each of the triggers is activated by applying an external voltage across the trigger input and the trigger ground. The following table specifies the mating connector and connector pins.

J24 – 5x2 JST PHD connector	
Description	Pin
Tx GND	1
Tx +ve	2
Tx -ve	3
Rx GND	4
Rx +ve	5
Rx -ve	6
Trigger 1	7
Trigger GND	8
Trigger 2	9
Trigger 3	10

When using RS422 the impedance of the Rx and Tx pairs can be switched between 120 ohms and high impedance via the jumpers J5 and J28 respectively. The impedance is 120 ohms with the jumper inserted.



4.6 Asynchronous RS232 – J25

The I300 provides a fully connected RS232 port for asynchronous serial communications on header J25. The following table specifies the mating connector and connector pins.

J25 – 5x2 JST PHD connector	
Description	Pin
DCD	1
RxD	2
TxD	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8
RI	9
GND	10

4.7 Synchronous RS232 – J26

The I300 provides an RS232 port for synchronous serial communications with devices generating a clock signal via header J26. The following table specifies the mating connector and connector pins.

J26 – 5x2 JST PHD connector	
Description	Pin
TxD	1
RxD	2
RTS	3
CTS	4
DCD	5
CLOCK	6
DTR	7
GND	8
<not connected>	9
<not connected>	10

4.8 Ethernet – J27

The I300 provides a 10/100 Base-T Ethernet port for IP communications on header J27. The following table specifies the mating connector and connector pins.

J24 – 4x2 JST PHDR connector	
Description	Pin
Pair A +ve	1
Pair A -ve	2
Pair B +ve	3
Pair C +ve	4
Pair C -ve	5
Pair B -ve	6
Pair D +ve	7
Pair D -ve	8

It is recommended that where possible shielded CAT-5E cable is utilised for linking J27 to a bulkhead RJ45 connector to ensure signal integrity and to avoid EM interference. Where this is not possible or where linkage to a companion device is internal to an enclosure, twisted pairs must be used for each of the four Ethernet pairs.

It is imperative that a shielded RJ45 connector be used where the connector is grounded to the enclosure (chassis ground) to avoid electromagnetic interference.

4.9 Status LEDs – J31 & J32

The operational status reporting of the I300 is provided via five common cathode tri-state LEDs where each should nominally be capable of illuminating as red, green, or orange (red plus green). The function of the LEDs is defined as follows where the function and states are detailed in the user manual;

LED 1	Power
LED 2	IP-Link
LED 3	Server-Link
LED 4	HSDPA/3G State
LED 5	EDGE/GPRS State

The I300 provides two headers to power the five status LEDs via J31 and J32. The forward voltage of the LEDs must be 2v @ 20mA. The following tables specify the mating connectors and connector pins for J31 and J32.

J31 – 5x2 JST PHDR connector

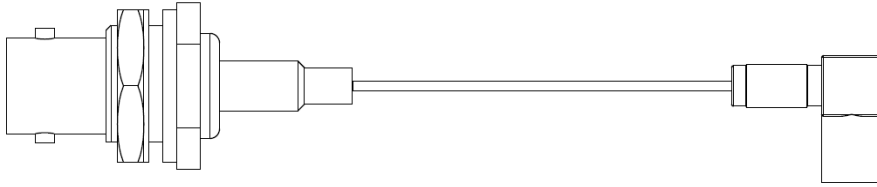
Description	Pin
LED 4 Red anode	1
LED 4 Green anode	2
LED 3 Red anode	3
LED 3 Green anode	4
LED 2 Red anode	5
LED 2 Green anode	6
GND	7
GND	8
GND	9
GND	10

J32 – 4x2 JST PHDR connector

Description	Pin
LED 5 Red anode	1
LED 5 Green anode	2
LED 1 Red anode	3
LED 1 Green anode	4
Reserved (do not connect)	5
GND	6
GND	7
GND	8

4.10 Video Output – J34

The I300 provides a single video output via a 75 ohm mini SMB connector on J34. Note that the connection from the board to the bulkhead connector must be 75 ohm coax cable and it is recommended that a 75 ohm BNC bulkhead connector is used as illustrated below.



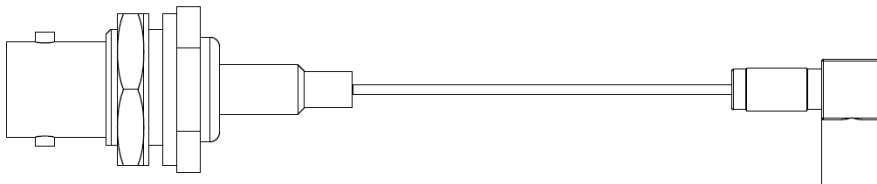
It is important to follow the manufacturer's instructions in the connection of the coax cable to the mini SMB connector and to the BNC connector to avoid EM interference and/or noise in the video signal. The bulkhead connector must be grounded to the enclosure (chassis ground).

4.11 Video Inputs – J35 & J36

The I300 provides two video inputs via two 75 ohm mini-SMB connectors.

- J35 – video input 1
- J36 – video input 2

Note that the connection from the board to the panel mount connector should be 75 ohm coax cable and it is recommended that 75 ohm coax bulkhead connectors are used as per the following illustration.



It is important to follow the manufacturer's instructions in the connection of the coax cable to the mini SMB connector and to the BNC connector to avoid EM interference and/or noise in the video signal. The bulkhead connectors must be grounded to the enclosure (chassis ground).

4.12 External SIM – J38

The I300 provides both a PCB mounted SIM carrier (J13) and a header supporting operation with a bulkhead mounted SIM via J38. Note that only one SIM can be utilised. The following table specifies the mating connector and connector pins.

J38 – 4x2 JST PHDR connector	
Description	Pin
SIM Power (Vcc)	1
SIM Data I/O	2
SIM Reset	3
SIM Inserted	4
SIM Clock	5
N/C	6
Chassis GND	7
Power GND	8

4.13 USB Ports – J39

The I300 provides two USB Host ports on header J39. The following table specifies the mating connector and connector pins.

J39 – 5x2 JST PHDR connector	
Description	Pin
USB B 5v DC	1
USB C 5v DC	2
USB B Data -ve	3
USB C Data -ve	4
USB B Data +ve	5
USB C Data -ve	6
USB B 0v DC	7
USB C 0v DC	8
Chassis GND	9
Chassis GND	10

It is imperative that the USB connector be grounded to the enclosure (chassis ground) to avoid electromagnetic interference.

5 Factory Configuration

The standard mechanism for installing firmware and for configuring the operational mode of an I300 is via a USB mass storage device.

The I300 uses non volatile memory to store firmware and configuration where the configuration partition includes both factory settings and user definable settings. The I300 supports OEM modification of the factory settings to allow for a degree of customisation to accommodate product specific features and product naming.

On inserting a USB pen drive the I300 searches for one of several files which define the subsequent operation to be carried out. It is imperative that the root of the pen drive contain only the files appropriate for one operation. The following are relevant for OEM integration.

5.1 OEM Defaults

The I300 supports the modification of a subset of the factory default configuration to allow for OEM customisation. These OEM defaults are retained when applying a factory reset. OEM defaults are applied by creating a single text file in the root of the pen drive with the name;

`.OEM_DEFAULTS`

The file should contain one or more settings each of the form;

`setting=value`

Each setting must start on a new line within the file. Note that if the file is empty, then the OEM defaults will be erased.

Supported settings are;

Setting	Function
vendor	<p>The vendor field is exported from the I300 to the TVI Server where this string is then provided to TVI Manager and as required to the Viewing Clients. This string will be displayed to inform the user as to the type of device. For example;</p> <pre>vendor=TVI I300</pre> <p>This would result in TVI Manager displaying the connected device as a "TVI I300".</p>
product	<p>The product field is used by the I300 board to determine the functionality and behaviour. For example;</p> <pre>product=I300</pre> <p>This would be used by the firmware to establish the board type and to control the application of user configuration settings.</p>

5.2 Factory Reset

It is possible to remove the configuration settings of an I300 and restore the unit back to the 'original factory defaults'. This operation does not remove any OEM Defaults that have been applied and so the I300 will retain any OEM Default settings applied. This operation is designed to be used by an end-user who wishes to reset their I300.

A factory reset is achieved by creating a single file in the root of the pen drive with the name;

```
.FACTORY_RESET
```

The file can be zero length as the I300 performs the reset based on the presence of the file rather than the file contents.

5.3 Complete Configuration Erase

The I300 supports a complete erase of all configuration settings including the OEM defaults to return the I300 to a blank state which may be required for manufacture testing. This is achieved by creating a single file in the root of the pen drive with the name;

```
.ERASE_CONFIG
```

The file can be zero length as the I300 performs the configuration erase based on the presence of the file rather than the file contents.

Cellular Operation

The choice of external antenna will depend on operational factors and on the frequency bands used by the selected network. To support global operation an antenna must support the following GSM / WCDMA frequency bands;

70 MHz in GSM850	80 MHz in GSM900
170 MHz in DCS & 140 MHz in PCS	70 MHz in WCDMA850
140 MHz in WCDMA1900	250 MHz in WCDMA2100

Where the network is known, the user should select the most suitable antenna based on the frequency band(s) provided by that network operator.

An antenna must have the following characteristics to match the Telit UC864-G modem;

VSWR absolute max $\leq 10:1$ recommended $\leq 2:1$
 Input power $> 33\text{dBm}$ peak power in GSM
 Input power $> 24\text{dBm}$ average power in WCDMA
 Impedance 50 ohm

Furthermore if the I300 is used in the US market and/or Canada market, it is the responsibility of both the manufacturer of the product containing the I300 and the end user to ensure that the use of the product complies with the FCC and/or IC approval requirements.

The system antenna(s) used for this product must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operate in conjunction with any other antenna or transmitter.

The system antenna(s) used for this product must not exceed 3 dBi for mobile and fixed or mobile operating configurations.

Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

The product manufacturers are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.

It is recommended that the I300 is powered down before a SIM is removed or inserted to avoid any inconsistency in the network settings stored by the Telit UC864-G module which may result in a failure to connect to the network.

6 Safety Recommendations



The I300 board contains ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment where discharge can occur without detection. Permanent damage may occur on devices subjected to high energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store any unused I300 boards in anti-static packaging.



The I300 uses an integrated Telit UC864-G cellular modem. The use of the I300 may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc.
- Where there is risk of explosion such as gasoline stations, oil refineries, etc.

Antenna characteristics must match those specified in this document and care must be taken during installation to avoid any interference with other electronic devices.

There must be a minimum separation between an antenna and the human body of 20 cm.



The I300 incorporates reverse voltage protection and surge protection against DC voltages not exceeding 50v DC.

Additional protection is recommended when operating from non regulated or vehicle power supplies.

It is recommended that an inline fuse be fitted when operating from a vehicle supply.



The power GND input corresponds to the I300 chassis ground and external power isolation must be used where there is a risk of accidental connection to mains level voltages.



It is the responsibility of the final unit manufacturer to ensure that the use of the I300 is allowed in the country where the unit is sold and that all necessary certification for the unit is in place.



Do not disassemble the I300 or attempt repair. Any mark of tampering will invalidate any warranty.